UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/698,001	10/30/2003	Hidenori Usuda	9319S-000575	7423

27572 7590 04/01/2008

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303

EXAMINER	
FIDLER, SHELBY LEE	

ART UNIT	PAPER NUMBER
2861	

MAIL DATE	DELIVERY MODE
04/01/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/698,001	USUDA ET AL.	
	Examiner	Art Unit	
	SHELBY FIDLER	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-13,16-28 and 33-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-13,16-28 and 33-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Art Unit: 2861

DETAILED ACTION

Responsive Office Action

This Office Action is responsive to the remarks and amendments filed 1/30/2008.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 and 16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Upon review of the original specification, Examiner was unable to find a disclosure to support the newly added limitation that the flushing process includes "selecting the cooling drive signal following each period of normal discharge". Examiner notes that the instant specification states that "If the temperature exceeds a predetermined threshold temperature, then . . . . the cooling drive signal CD is applied to the piezoelectric elements 30" (page 17), and that cooling discharge "is not always necessary if there is time allowance before the next normal discharge" (page 20). Therefore, the cooling drive signal is selected only when the temperature exceeds a predetermined threshold, and only if the subsequent normal discharge period is shortly thereafter. This disclosure seems to contrast to the currently

amended claims, which state that cooling discharge, via flushing, is selected "following each period of normal discharge".

For the purpose of examination, the limitation that the flushing process includes "selecting the cooling drive signal following each period of normal discharge" will be treated as "selecting the cooling drive signal following periods of normal discharge."

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5, 8, 16, 17, 20, 22, 23, and 33-35 rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. (US 6386672 B1) in view of Fukuda et al. (US 5066964).

Regarding claims 1 and 16:

Kimura et al. disclose a droplet discharging apparatus comprising:

means for discharging a discharge liquid (recording head) in the form of droplets through an aperture (nozzle opening 2) by mechanically deforming a piezoelectric element (piezoelectric vibrator 9) by a normal drive signal (col. 9, lines 4-9);

a drive integrated circuit (semiconductor integrated circuit 20) disposed adjacent to and in thermal contact with the piezoelectric element (Fig. 2);

a control unit (drive circuit shown in Fig. 22) that selects between the normal drive signal (drive signal corresponding to T1) and a cooling drive signal (drive signal corresponding

to T2) and supplies the selected normal drive signal or cooling drive signal to the drive integrated circuit (col. 8, lines 40-57 and Fig. 22);

a substrate (fixed base 18) attached to and in thermal contact with the piezoelectric element and the drive integrated circuit (Fig. 2);

a diaphragm (elastic plate 10) disposed adjacent to and in thermal contact with the piezoelectric element (col. 3, lines 32-35 and Fig. 2); and

a temperature sensor (diode forming area 66) associated with the drive integrated circuit (Fig. 20a) for sensing a temperature of the drive integrated circuit (col. 8, lines 7-8);

wherein the sensed temperature of the drive integrated circuit reflects an operating heat of the piezoelectric element due to the piezoelectric element being thermally coupled to the drive integrated circuit via the substrate (this property is inherent to the disclosure of col. 9, lines 10-16 & Fig. 2);

wherein the sensed temperature of the drive integrated circuit reflects the temperature of the discharge liquid due to the thermal connection of the discharge liquid, the diaphragm, the piezoelectric element, the substrate, and the drive integrated circuit (this property is inherent to the disclosure of col. 9, lines 10-16 & Fig. 2);

wherein the control unit selects between the normal drive signal and the cooling drive signal based on the temperature of the discharge liquid (col. 8, lines 40-55);

wherein the droplets are discharged from the aperture based on the selected normal drive signal or cooling drive signal (col. 8, lines 47-57).

Kimura et al. do not expressly disclose that a flushing process is implemented between cycles of normal discharge, wherein the flushing process includes selecting the cooling drive

signal following periods of normal discharge to set the temperature of the discharge liquid to predetermined temperature prior to initiating a subsequent normal discharge.

However, Kimura et al. do disclose that the cooling drive signal is selected following periods of normal discharge (printing) to set the temperature of the discharge liquid to a predetermined temperature prior to initiating a subsequent normal discharge (col. 8, lines 47-57); and

Fukuda et al. disclose that it is known to perform flushing between cycles of normal discharge to set the temperature of the discharge liquid to a predetermined temperature prior to initiating a subsequent normal discharge (col. 2, lines 16-35).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize the cooling drive signal during flushing between cycles of normal discharge, such as disclosed by Fukuda et al., into the invention of Kimura et al. One motivation for utilizing such an operation, as suggested by Fukuda et al., is to lower the liquid temperature of the recording head (col. 2, lines 28-34).

Regarding claims 2 and 17:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, and **Kimura et al. also disclose** that the droplets are discharged for a plurality of times by the cooling drive signal (inherent to col. 8, lines 47-50 since the temperature ranges are so large) so as to cool the discharge liquid to a specified temperature (col. 5, lines 32-37).

Regarding claims 5 and 20:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, and **Kimura et al. also disclose** that, if the temperature of the discharge liquid detected by a temperature detecting means exceeds a predetermined threshold temperature (e.g. 10 degrees

Celsius), then the droplets are discharged from the aperture by the cooling drive signal (col. 8, lines 52-54).

Regarding claims 8 and 23:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, and **Kimura et al. also disclose** that the discharge liquid is a printing ink (col. 9, lines 4-9).

Regarding claim 22:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claim 16, and **Kimura et al. also disclose** that cooling discharge is carried out during normal discharge (col. 8, lines 40-55).

Regarding claim 33:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claim 1, and **Kimura et al. also disclose** that the diaphragm separates the piezoelectric element from the discharge liquid (Fig. 2).

Regarding claim 34:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claim 1, and **Kimura et al. also disclose** that the piezoelectric element and the drive integrated circuit are attached to the substrate by an adhesive (adhesives 21, 22, 23 - Fig. 2).

Regarding claim 35:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claim 1, and **Kimura et al. also disclose** that the piezoelectric element and the drive integrated circuit are attached to the substrate and are spaced apart from one another (Fig. 2).

Claims 3 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. as modified by Fukuda et al., as applied to claims 1 and 16 above, and further in view of Kubo (US 6257688 B1).

Regarding claims 3 and 18:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that the cooling drive signal is set to a low frequency level that does not cause the piezoelectric element to heat the discharge liquid.

However, Kubo disclose a cooling drive signal that is set to a low frequency level that does not cause the piezoelectric element to heat the discharge liquid (col. 6, lines 36-40).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize a cooling drive signal that is set at a low frequency into the invention of Kimura et al. as modified by Fukuda et al. One motivation for utilizing such a low frequency level, as taught by Kubo, is to avoid spray of ink when the temperature is high (col. 6, lines 50-54).

Claims 4 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. as modified by Fukuda et al., as applied to claims 1 and 16 above, and further in view of Tajika (US 5861895).

Regarding claims 4 and 19:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that the cooling drive signal has a waveform shape as to cause droplets of maximum weight.

However, Tajika discloses a cooling drive signal with a waveform shape as to cause droplets of maximum weight (col. 11, lines 33-35).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize Tajika's waveform to provide droplets of maximum weight into the invention of Kimura et al. as modified by Fukuda et al. One motivation for utilizing a maximum weight waveform shape, as taught by Tajika, is to minimize problems with temperature control (col. 11, lines 25-28).

Claims 6 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. as modified by Fukuda et al., as applied to claims 1 and 16 above, and further in view of Nozawa (US 6499821 B1).

Regarding claims 6 and 21:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that, if the number of discharges within a predetermined time performed in response to the normal drive signal exceeds a predetermined threshold number of times, then the droplets are discharged from the aperture by the cooling drive signal.

However, Nozawa disclose that, if the number of discharges within a predetermined time performed in response to a normal drive signal exceeds a predetermined threshold number of times, then droplets are discharged from the aperture by a cooling drive signal (col. 8, lines 1-12).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize Nozawa's threshold discharge count into the invention of Kimura et al. as modified by Fukuda et al. The motivation for doing so, as taught by Nozawa, is to avoid a "scorch" condition (col. 7, line 65 – col. 8, line 6).

Claims 9, 11-13, 24, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. as modified by Fukuda et al., as applied to claims 1 and 16 above, and further in view of Usui et al. (US 6981761).

Regarding claims 9 and 24:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that the discharging liquid is an electrically conductive material for forming a wiring pattern.

However, Usui et al. disclose a discharging liquid that is an electrically conductive material for forming a wiring pattern (col. 27, lines 13-15).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize an electrically conductive discharging liquid, such as disclosed by Usui et al., into the invention of Kimura et al. as modified by Fukuda et al. One motivation for utilizing such a discharging liquid, as taught by Usui et al., is to enable the manufacture of wiring (col. 27, lines 13-15).

Regarding claims 11 and 26:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that the discharge liquid is a resin for forming a color layer of a color filter.

However, Usui et al. disclose a discharging liquid that is a resin for forming a color layer of a color filter (col. 25, lines 28-31).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize a resin discharging liquid, such as disclosed by Usui et al., into the invention of Kimura et al. as modified by Fukuda et al. One motivation for utilizing such a discharging liquid, as taught by Usui et al., is to enable the manufacture of a color filter (col. 25, lines 28-31).

Regarding claims 12, 13, 27, and 28:

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that the discharge liquid is a fluorescent organic compound exhibiting electroluminescence.

However, Usui et al. disclose a discharge liquid that is a fluorescent organic compound exhibiting electroluminescence (col. 27, lines 27-30).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize a fluorescent organic compound discharging liquid, such as disclosed by Usui et al., into the invention of Kimura et al. as modified by Fukuda et al. One motivation for utilizing such a discharging liquid, as taught by Usui et al., is to enable the manufacture of EL display devices (col. 27, lines 24-27).

Claims 10 and 25 rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. as modified by Fukuda et al., as applied to claims 1 and 16 above, and further in view of Shinoura (US 6714173 B2).

Regarding claims 10 and 25:

Art Unit: 2861

Kimura et al. as modified by Fukuda et al. disclose all the limitations of claims 1 and 16, but **Kimura et al. as modified by Fukuda et al. do not expressly disclose** that the discharge liquid is a transparent resin for forming a microlens.

However, Shinoura discloses a discharge liquid that is a transparent resin for forming a microlens (col. 9, lines 40-43).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize a transparent resin discharging liquid, such as disclosed by Shinoura, into the invention of Kimura et al. as modified by Fukuda et al. One motivation for utilizing such a discharging liquid, as taught by Shinoura, is to produce lenses (col. 9, lines 22-25).

Response to Arguments

Applicant's arguments regarding claims 1 and 16 have been considered.

Applicant asserts that Kimura fails to disclose a control unit that selects between a normal drive signal and a cooling drive signal based on a sensed temperature of a drive integrated circuit. Specifically, Applicant asserts that Kimura fails to disclose selecting between a pair of signals because Kimura discloses adjusting a single drive signal based on a sensed temperature. Examiner respectfully disagrees. Kimura discloses that either the drive signal is transmitted directly to the piezoelectric vibrators, or that the drive signal is decreased by a certain percentage before being transmitted to the piezoelectric vibrators (col. 8, lines 46-55). Therefore, Kimura discloses selecting between an unaltered drive signal and a reduced drive signal. Examiner notes that the currently amended claim language does preclude the normal drive signal and the cooling drive signal to be based on the same drive signal.

Applicant also asserts that Kimura fails to disclose selecting a cooling drive signal following each period of normal discharge to set a temperature of a discharge liquid to a predetermined temperature prior to initiating a subsequent normal discharge. However, Examiner was unable to find sufficient disclosure to support such an amendment. Please see the rejections above.

Please see the above obviousness-type rejection based on the disclosures provided by Kimura et al. and Fukuda et al. A logical combination of these teachings shows that it would have been obvious to provide a flushing process that includes selecting the cooling drive signal following periods of normal discharge to set the temperature of the discharge liquid to a predetermined temperature prior to initiating a subsequent normal discharge.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 2861

Communication with the USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHELBY FIDLER whose telephone number is (571)272-8455. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Luu can be reached on (571) 272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Shelby Fidler/
Patent Examiner
AU 2861

/LUU MATTHEW/
Supervisory Patent Examiner, Art Unit 2861